PATENT COOPERATION TREATY

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To:

see form PCT/ISA/220

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)* see form PCT/ISA/210 (second sheet)	

Applicant's or agent's file reference	**FOR FURTHER ACTION**
see form PCT/ISA/220	See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2004/003731	07.04.2004	09.04.2003

International Patent Classification (IPC) or both national classification and IPC

G06F9/46

Applicant

JALUNA SA

1. This opinion contains indications relating to the following items:

- ☒ Box No. I   Basis of the opinion
- ☐ Box No. II   Priority
- ☐ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV   Lack of unity of invention
- ☒ Box No. V   Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI   Certain documents cited
- ☐ Box No. VII   Certain defects in the international application
- ☐ Box No. VIII   Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Authorized Officer
European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Bijn, K Telephone No. +31 70 340-4472

Box No. I   Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

    ☐   This opinion has been established on the basis of a translation from the original language into the following language   , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

    a. type of material:

        ☐   a sequence listing

        ☐   table(s) related to the sequence listing

    b. format of material:

        ☐   in written format

        ☐   in computer readable form

    c. time of filing/furnishing:

        ☐   contained in the international application as filed.

        ☐   filed together with the international application in computer readable form.

        ☐   furnished subsequently to this Authority for the purposes of search.

3. ☐   In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. IV   Lack of unity of invention

1. ☒   In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:

    ☒   paid additional fees.

    ☐   paid additional fees under protest.

    ☐   not paid additional fees.

2. ☐   This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

    ☐ complied with

    ☒ not complied with for the following reasons:

    see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

    ☐ all parts.

    ☒ the parts relating to claims Nos. 1-14, 20, 21, 25, 26, 28, 29, 32-36

Box No. V   Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4, 8, 9, 21, 25, 26, 32-36
	No:	Claims	1-3, 5-7, 10-14, 20, 28, 29
Inventive step (IS)	Yes:	Claims	8, 9, 32-36
	No:	Claims	4, 21, 25, 26
Industrial applicability (IA)	Yes:	Claims	1-14, 20, 21, 25, 26, 28, 29, 32-36
	No:	Claims	

2. Citations and explanations

    see separate sheet

The following documents are referred to in this communication:
D1: EP 162 536 (HITACHI LTD) 12 December 2001
D2: EP 1054322 (HITACHI LTD) 22 November 2000

Re Item IV
Lack of unity of invention

The application does not meet the requirements of Unity of Invention as defined in Rules 13(1) & (2) PCT.

The present application relates to a group of inventions, corresponding to the following sets of claims:
* **claims 1-12, 20, 21, 25, 26, 28, 29, 32-36**: Handling processor exceptions for the second operating system in virtual fashion;
* **claims 13-14**: Providing access to shared input and/or output devices;
* **claims 15-18**: Restarting the second operating system without interrupting operation of the first operating system;
* **claim 19**: Debugging the operating systems;
* **claims 22-24, 27**: Providing inter-operating system communication;
* **claims 30, 31**: modifying each operating system for operating in multiple operating system mode.

The relevant prior art, disclosed in *D1*, describes a method of enabling multiple different operating systems to run concurrently on the same computer (see above).

From the difference over *D1*, as defined by the additional features of *claims 8, 32-34* it is determined that the technical problem solved by the subject-matter of the *first* set of claims is *preventing the second operating system from masking hardware interrupts*. The Special Technical Features contributing to this solution are *handling the processor exceptions for the second operating system in a virtual fashion by the common program*.

From the difference over *D1*, as defined by the additional features of *claim 13*, it is determined that the technical problem solved by the subject-matter of the *second* set of

claims is *providing access to the shared input and/or output devices of the computer.* The Special Technical Features contributing to this solution are *providing each of the first and second operating systems with devices to which each has shared access in which each operating system accesses those devices using the routines of the first operating system.*

From the difference over *D1*, as defined by the additional features of *claim 15*, it is determined that the technical problem solved by the subject-matter of the *third* set of claims is *that restarting the second operating system can interrupt the operation of the first operating system or the common program.* The Special Technical Features contributing to this solution are *providing a restart routine for restarting the second operating system without interrupting operation of the first operating system or the common program.*

From the difference over *D1*, as defined by the additional features of *claim 19*, it is determined that the technical problem solved by the subject-matter of the *fourth* set of claims is *debugging the first and second operating systems.*The Special Technical Features contributing to this solution are *providing a debug routine, in which the common program is arranged to output the states of machine state variables on occurrence of predefined conditions in the operation of said operating systems.*

From the difference over *D1*, as defined by the additional features of *claim 22*, it is determined that the technical problem solved by the subject-matter of the *fifth* set of claims is *allowing communication between the first and second operating systems so that said operating systems can communicate as if by a communications bus.*The Special Technical Features contributing to this solution are *that the common program defines virtual input and/or output devices corresponding to communications bus bridges.*

From the difference over *D1*, as defined by the additional features of *claim 30*, it is determined that the technical problem solved by the subject-matter of the *sixth* set of claims is *modifying each operating system for operating in multiple operating system mode.*The Special Technical Features contributing to this solution are *providing each operating system with an idle routine, in which it passes control to the common*

program.

The Special Technical Features corresponding to the *six* groups of claims are not the same and do not correspond because they do not address the same problem. Consequently, there is no single general inventive concept linking the five sets of claims, and therefore the requirement of Rules 13(1) & (2) PCT with regard to Unity of Invention is not fullfilled.

Re Item V
Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1   The present application does not meet the requirements of Article 33(2) PCT, because the subject-matter of **claims 1-3, 5-7, 10-14, 20, 28, 29** is not novel in the sense of Rule 64 PCT.

1.1   *D1* discloses a method of enabling multiple different operating systems to run concurrently on the same computer *([0001])*, comprising:
   * selecting a first operating system *(OS-B)* to have a relatively high priority *(col 4, lines 31-35)*;
   * selecting at least one second operating system *(OS-A)* to have a relatively lower priority;
   * providing a common program *(inter-OS control software)* arranged to switch *([0032]-[0034])* between said operating systems under predetermined conditions;

   D1 does not explicitly disclose the step of *providing modifications to said first and second operating systems to allow them to be controlled by said common program.* However, since OS-B and OS-A run concurrently on the same computer under control of the inter-OS control software, it implicitly follows that OS-B and OS-A have been modified in order to allow them to be controlled by the inter-OS control software.

   The subject-matter of **claim 1** is therefore not novel.

1.2   *D1* further discloses that the first and second operating systems are a real-time and a non-real time general purpose operating system, respectively *([0013] & [0014])*.

The subject-matter of **claims 2, 3** is therefore not novel.

1.3   *D1* further discloses the additional features of:

* claim 5: the common program is arranged to save, and to restore from a saved version, the processor state required to switch between operating systems *(col 2, lines 12-23)*;
* claim 10: providing each of said operating systems with separate memory spaces in which each can exclusively operate *(col 3, lines 57-58; par. [0023]-[0026]; fig. 2)*.

The subject-matter of **claims 5, 10** is therefore not novel.

1.4   *D1* further discloses handling processor exceptions for the second operating system *(OS-A)* in virtual fashion by the common program *(the interrupt by the hardware managed by OS-A is masked and does not occur while OS-B is in operation - col 8, lines 46-51)*.

The subject-matter of **claim 6** is therefore not novel.

1.5   *D1* further discloses that the common program is arranged to intercept some processor exceptions, and to call exception handling routines of the first operating system *(OS-B)* to service them *(col 8, lines 35-54)*.

The subject-matter of **claim 7** is therefore not novel.

1.6   *D1* further discloses that each of said operating systems are provided with first input and/or output devices of said computer to which each has exclusive access *(par. [0017]-[0018])*.

The subject matter of **claim 11** is therefore not novel. .

1.7 *D1* further discloses that each operating system accesses said first input and/or output devices using its unmodified routines *(par. [0019])*.

The subject matter of **claim 12** is therefore not novel.

1.8 *D2* discloses a method of enabling multiple different operating systems to run concurrently on the same computer *([0001])*, comprising:
* selecting a first operating system *(real-time OS)* to have a relatively high priority *(...to operate the real-time OS preferentially...; col 2, line 40)*;
* selecting at least one second operating system *(general purpose OS)* to have a relatively lower priority;
* providing a common program *(inter-OS control function 124)* arranged to switch *(OS context switching function; [0020])* between said operating systems under predetermined conditions;

D2 does not explicitly disclose the step of *providing modifications to said first and second operating systems to allow them to be controlled by said common program.* However, since the real-time OS and the general purpose OS run concurrently on the same computer under control of the inter-OS control function, it implicitly follows that the real-time OS and the general purpose OS have been modified in order to allow them to be controlled by the inter-OS control function.

D2 further discloses *(par. [0001], [0010], [0043]-[0045], [0065]-[0070])* that each of said operating systems are provided with access to second input and/or output devices of said computer to which each has shared access.

The subject matter of **claim 13** is therefore not novel.

1.9 *D2* further discloses *(col 3, lines 42-52; par [0044]-[0045]; col 25, lines 22-31)* that all operating systems access said second input and/or output devices using the routines of the first operating system *(a client-server model for the input and output process)*.

The subject matter of **claim 14** is therefore not novel.

1.10 *D1* further discloses that said operating systems and the common program are combined into a single code product *(col 4, lines 45-49)*.

The subject-matter of **claim 20** is therefore not novel.

1.11 The technical features of system claim 28 correspond with the method steps of claim 1.

Therefore, the subject-matter of **claim 28** is not novel either.

1.12 Since the computer system and the method, both referred to in claim 29, are not novel, this computer system arranged to run the first and second operating systems concurrently using this method is not novel either.

The subject-matter of **claim 29** is therefore not novel.

2 The present application does not meet the requirements of Article 33(3) PCT, because the subject-matter of **claims 4, 21, 25, 26** does not involve an inventive step in the sense of Rule 65 PCT.

2.1 To the person skilled in the art, *the choice of Linux, or a version or variant thereof, as the second operating system* is a selection among a number of known and equally like alternatives that does not achieve an unexpected technical effect that goes beyond what could normally be expected in the technical field concerned.

Therefore, the subject matter of **claim 4** does not involve an inventive step.

2.2 The subject-matter of claim 21 differs from the method disclosed in *D1* in that said operating systems and common program are embedded onto persistent memory on a computer product.

The technical effect, produced by these additional features, is that the operating systems and common program are not lost when power is switched off.

The problem to be solved by the subject matter of claim 21 may therefore be regarded as making the operating systems and common program persistent.

However, to the skilled person, it is common knowledge to embed the operating systems and common program onto persistent memory on a computer program product in order to solve the aforementioned problem.

Therefore, the subject matter of **claim 21** does not involve an inventive step.

2.3 Since the steps of method claim 1, referred to in claim 25, are not novel, a computer program product comprising code for performing the steps of this method is not considered to be inventive.

Therefore, the subject-matter of **claim 25** does not involve an inventive step.

2.4 Since the code combined according to claim 20 does not involve an inventive step, a computer program product comprising this code is not considered to be inventive.

Therefore, the subject-matter of **claim 26** does not involve an inventive step.

3 The subject-matter of claims 8, 9, 32-36 differs from what is disclosed in *D1* in that *the processor exceptions for the second operating system are notified as virtual exceptions.*

The technical effect, produced by these distinguishing features, is that *the second operating system is prevented from masking hardware interrupts.*

The problem to be solved by the subject-matter of claims 8, 9, 32-36 may therefore be regarded as how to prevent the *second operating system from masking hardware interrupts.*

None of the prior art documents discloses or suggests the additional features of claims 8, 9, 32-36 to solve the aforementioned problem.

Therefore, the subject-matter of **claims 8, 9, 32-36** appears to be novel and inventive.